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REPORT

OF THE

COMMITTEE ON DISINFECTANTS,

MADE TO THE

BOARD OF HEALTH

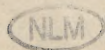
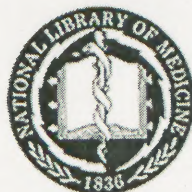
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IN BOARD OF HEALTH,

WASHINGTON, D. C., *June 4, 1867.*

The following Report from the Committee on Disinfectants was submitted by its Chairman, Dr. D. Webster Prentiss, of the Third Ward, adopted by the Board, and ordered to be published for general distribution.

G. M. DOVE, M. D.,

Secretary Board of Health.

REPORT

OF

COMMITTEE ON DISINFECTANTS.

The committee which have the honor to report to-day were appointed to "consider the subject of disinfectants, and report to the board the proper articles to be used as such, and suggest the manner in which they can be most advantageously applied."

This lays open a broad subject for consideration, and one upon which a legion of articles and pamphlets have within the past three years been written, many of them upon occasions similar to the one which calls for a report to-day. It is, however, the desire of the committee to be as brief as the nature of the subject will allow, and they will endeavor to give only considerations of practical importance, and mention only those agents whose value is undoubted from extended experience.

To arrive at a full understanding of the object before us, it is necessary to obtain a more correct and exact idea of the meaning of the term *disinfectant* than is contained in its ordinary acceptance.

"Disinfection, in the widest sense of the term, includes deodorization, and means the neutralization or destruction of all substances arising from putrifying organic matter or emanating from diseased animals, (persons,) either injurious to health or offensive to the sense of smell." (Wm. Crookes', F. R. S., report to her Majesty's commissioners on the application of disinfectants in arresting the spread of the cattle plague.—*London Chemical News*, June, 1866.) It is not sufficient to *deodorize*—that is to destroy such gases as sulphuretted hydrogen, phosphoretted hydrogen, and ammonia, which are offensive on account of their odor—but also, which is by far the most important, to destroy those emanations that are in-

jurious to health—which we know exist, but are not recognizable to any of our senses.

This end may be attained in two ways: 1. By the use of those agents which decompose the effluvia of putrefaction, and destroy the putrid matter itself by oxidation or a similar process. This is the province of *disinfectants* in the *limited* sense of the word. 2. By the use of those agents which prevent the tendency to putrefaction, or check that process when established and destroy the germs of organic life. These are called *antiseptics*.

The former of these classes is the most popular because it addresses itself directly to our perceptive faculties by clearing at once a vitiated atmosphere of its foul odors; but it is not, however, of as great sanitary importance as the latter class, because the antiseptic acts upon the more correct principle of obviating the difficulty by striking at the root of the evil, and removing its cause.

The *deodorizers*, of which chlorine may be taken as the type, have the greatest affinity for the gases which constitute foul odors, and their first action is upon them.

It is to be observed, however, that these gases do not in themselves produce disease, and there is no evidence of their being detrimental to health, unless they are the bearers of a specific virus, or are present in sufficient quantity to impede respiration. The relation between the process of putrefaction and the prevalence of epidemic disease is, that this process furnishes a favorable *nidus* for the development of the specific spores or germs of that disease, and they are disseminated with the putrid emanations. The action of the deodorizer is first upon these emanations and afterwards, if it be not by that time exhausted, upon the real source of danger; the impurity of the atmosphere may be no longer observable by the sense of smell, but the true danger of infection be as great as before. The protective agent, to be effective, must be in greater abundance than merely to neutralize foul odors. The correctness of this statement is well illustrated by the following experiment: "Cheese mites were put into water mixed with strongly smelling cheese and sulphuretted hydrogen. Watery solution of chlorine was gradually dropped into the

mixture from a burette. The smell of sulphuretted hydrogen was the first to go, then some smell of cheese, but it required a considerable quantity of chlorine to kill the mites. Exactly the same experiment was then repeated, only leaving out the sulphuretted hydrogen and cheese. The chlorine had now nothing to divert its energy from the cheese mites, which were consequently killed before one fourth the quantity of chlorine used in the first instance had been added." (Wm. Crookes, F. R. S.)

The cheese mites in this experiment stand in place of the specific germs of disease.

Antiseptics, on the other hand, begin at the opposite end of the scale; they produce no effect upon the offensive effluvia, and do not, therefore, recommend themselves to popular prejudice; they do not *destroy* putrid matter, but they avoid the necessity of destroying by rendering chemical change impossible, and are *disinfectants* by killing the germ of infection. Salt meat and smoked bacon are familiar instances of the antiseptic properties of common salt and saltpetre and of smoke. A very important advantage possessed by this class over the preceeding is, that here the effect is permanent, while in the former instance it is only temporary.

A piece of meat was allowed to become putrid and then cut into two pieces; one piece was immersed in chlorine water, which immediately dissipated all unpleasant odor; but on being again hung up, it was, in a few days, as putrid as before. The second piece was dipped in a solution of carbolic acid, (active principle of smoke,) after which the fætor still remained, though somewhat masked by the smell of the carbolic acid. This piece was also exposed in a warm place, but no change took place in three weeks, except from drying. Numerous experiments might also be quoted to prove how readily and quickly the true antiseptics destroy all the lower forms of minute organized life; but we content ourselves with a statement of the fact.

In the practical application of these principles it is to be remembered that many of the agents of either of the above classes combine, to a greater or less extent, the properties of both—the class in which they are placed being determined by the predominating property.

Thus, quick lime is a powerful deodorizer from its being such a wonderful absorbent of vapors; and is also antiseptic from its chemical affinities as a caustic alkali.

Reverting again to the *general* term *disinfectants*, we find that they differ very greatly among themselves, possessing very different and, in some instances, antagonistic properties, although having the same end for their object. If we look also into the subject-matter for disinfection we will perceive that here too its nature and character are different under different circumstances.

We must conclude, therefore, that all agents called by the name *disinfectant* will have a proper application under appropriate circumstances; and it appears there is *some* show of reason for the reputation claimed for the self-lauded patent nostrums with which the market is crowded. But it requires little exercise of the reasoning power to show the futility of expecting any one agent to meet all the indications demanded under different aspects of the case. As well, indeed, might the physician treat all diseases with one remedy, and think he was performing his whole duty.

One other general suggestion and we will proceed to the consideration of the individual means by which the above indications are to be met. Sanitary measures to be most effective must precede the development of an epidemic and not be left until the enemy is upon us and has obtained a foothold. "That it is easier to prevent than to cure," is an adage which all are willing to acknowledge the truthfulness of, yet few have sufficient forethought to act upon.

It is especially true of the epidemic disease, *cholera*, as has been abundantly illustrated by late experience. If disinfection and policing be perfect, the scourge is prevented from effecting a lodgment; and where it has already seized a victim, is circumscribed and limited. Let not, then, the lesson taught by past experience be lost sight of nor neglected, but take such action as shall not permit this city to be found unprepared, should pestilence fall upon us.

AGENTS TO BE USED AS DISINFECTANTS.

1. *Perfect cleanliness and good ventilation* are the best of

all disinfectants, to which all other agents are to be considered as adjuvants. Every street, alley, and gutter in the city should be inspected and, where necessary, cleansed, and then kept under constant supervision that they may remain clean. The same care should be exercised in private residences, tenant houses, hotels, public schools, etc., and the drains, cellars, vaults, and privies kept in a state of hygienic cleanliness.

It is only by systematic attention to the smaller evils, as well as the greater, that the desired object can be accomplished. Little or no good is done by spasmodic efforts to enforce sanitary rules. "A plentiful supply of water and air and a good system of sewerage and drainage as inducements to cleanliness, and a good sanitary police, directed with knowledge, and armed with power, can alone be considered as disinfectant for cities." (*Squibb on Disinfectants.*)

2. *Heat and Cold.* Heat is, under some circumstances, the best and most thorough disinfecting agent that we can employ. The heat of boiling water (212 deg. Fahr.) destroys the germs of almost all the lower orders of creation, such as are supposed to be intimately connected with the production of disease, and since it cleanses at the same time is especially applicable to purifying the clothing, etc., which have been used about patients. A dry heat of 280 deg. is absolutely destructive to all manner of living organisms, and can be depended on for perfect disinfection of such articles that propagate disease, but cannot be subjected to the boiling process, such as bales of dry goods, merchandise, etc.

Cold or freezing is a much less effective agent than heat, because it only *suspends* the activity of the noxious processes, but does not destroy the vitality of the elements concerned. Therefore, as soon as a higher temperature supervenes, they are restored with all their former virulence.

Freezing can then only be employed with advantage as a temporary measure until more effective steps can be taken.

DISINFECTANTS PROPER.

3. *Sanitary Lime*, (a name suggested by Dr. E. R. Squibb to apply to lime properly prepared for sanitary purposes.) Quick lime, dry and in the form of powder.

This substance combines eagerly and greedily with its weight of water, and absorbs *sixteen hundred times* its volume of watery vapor, without losing its solid and apparently dry condition. (Squibb.) Along with the watery vapor is also taken up and destroyed the effluvia and spores of which it is the vehicle. The lime possesses the double properties of a caustic alkali—poisoning the pabulum of organic life, coagulating the albumen of the ultimate cells, saponifying the fats, and forming insoluble compounds, practically, with many of the products of putrefaction.

It is to be applied by placing it in shallow pans about damp rooms, or sprinkling in moist places and upon matter undergoing putrefaction. In the liquid form of whitewash its advantages are too well known and too obvious to need more than a mention.

The ease and safety with which quick lime may be applied, and its abundance and cheapness, makes it best adapted to the purpose of out-door *disinfection*, where any agent to be effectual must be used without stint.

4. *Sanitary Charcoal*, (Squibb,) freshly burned and in form of powder, absorbs twenty times its volume of hurtful vapors and gases of putrefaction, and holds them in its pores to undergo decomposition. If a quantity of charcoal be thrown upon a putrefying mass it renders it innocuous by absorbing the emanations, and while it remains, continues to act as a filter to all gasses that are disengaged below it. The charcoal in this case is also beneficial in another manner, by protecting the mass from the action of the air, which is necessary to putrefactive changes, and at the same time forms a partition, as it were, between the original substances and any others that may be added from above, as in cess-pools. Charcoal, in common with quick-lime, has a strong recommendation to general use on account of its low cost and easy accessibility, as well as in its properties. The properties of both these agents are such as to have suggested to Dr. Squibb the propriety of uniting the two into one powder, for use as a general disinfectant. Charcoal is a great absorber of gases, and acts with greatest energy when perfectly dry. Quick-lime, on the other hand, is a great absorber of moisture, and

when the two are mixed, therefore, the latter assists the action of the former by keeping it in a dry condition.

Dr. Squibb has proposed the name of "*calx powder*" to a mixture of two parts of quick-lime to one of charcoal, ground in course powder. Under this name, it was successfully used last summer by the New York Board of Health.

The disinfectant properties of charcoal will themselves suggest the manner and circumstances in which it is to be used.

5. *Chlorine: Chlorinated Lime or Bleaching powder.* Chlorine, on account of its gaseous form, is the best agent we possess for ridding the air immediately and thoroughly of foul odors. It penetrates into holes and dark corners, where these odors are likely to accumulate, and destroys them. It is more especially applicable for use in confined spaces—as the sick room, closets, cellars, &c.; but, in form of chlorinated lime, may also be employed in the same manner as quick-lime.

It is not necessary to dwell here upon the different chemical processes by which chlorine gas is given off. The common bleaching powder, chlorinated lime, is the most practicable source of it for common use—a saucerful of this powder giving off the gas continuously in small quantity when exposed to the air. If larger quantities be needed, it can be obtained by pouring strong vinegar or dilute sulphuric acid into the saucer. The *bleaching powder* has also the advantage over other sources of chlorine; that it combines the disinfectant properties of both chlorine gas and lime; and is at the same time inexpensive, costing in New York, at whole sale price, not more than five or six cents per pound.

6. *Ozone*—A supposed nascent state of oxygen, which possesses oxidizing properties to a powerful degree, and destroys putrid and infectious emanations by a process of super-oxidation. For the purposes of disinfection, it is eliminated by the exposure of phosphorus to the air; but as the management of this process requires considerable attention, and its use is attended with danger, it is not considered of practical importance enough to deserve more than a mere mention. If used at all, it would only be in a confined space.

ANTISEPTICS.

7. *Metallic Salts*, (sulphate of iron, protchloride of iron, chloride of zinc, and nitrate of lead)—These salts all act in a similar manner to destroy the vitality of the lower organisms, and prevent putrefactive changes. As previously intimated, they possess the additional advantage—one of much importance—of being permanent in their action. The first mentioned—sulphate of iron or copperas—is the best adapted to general use, on account of its cheapness and abundance, and because it is of easy and safe application. It exerts no injurious action upon either iron, zinc, or plaster, which is an item of no little importance when we remember that it is to be used in sinks, water closets, and drains. It is recommended as the best protective agent against cholera, by distinguished authority, and as such was mainly relied upon last season by Board of Health of New York.

All collected evidence upon the subject shows that the infectious principle of cholera is mainly contained in the discharges, and that these discharges when allowed to stand, speedily become alkaline—giving out ammonia.

When treated with the copperas solution this is entirely prevented, and they are no longer dangerous. (Dr. Max. Pettenkofer, Rankin's abstract 1866.)

Copperas "is to be used to disinfect the discharges of cholera patients, and to purify privies and drains.

"Dissolve ten pounds in a common pailful of water, and pour a quart or two of this solution into the privy, water closet, or drain every hour, if cholera discharges have been thrown into those places; but for ordinary use, to keep privies and water closets from becoming offensive, pour a pint of this solution into every water closet pan, and privy seat, night and morning. * * * Bedpans and chamber vessels are best disinfected by a spoonful of this solution and a spoonful of chlorinated lime." (New York Board of Health report, 1866.)

The price of sulphate of iron is two cents per pound in New York by the wholesale.

8. *Mineral Acids*. These act in the same manner as the preceding class, but are in no way superior.

They possess, at the same time, disadvantages which will prevent their general use, being corrosive to metals, to plaster, and to clothing.

Sulphurous acid formed by burning sulphur in the open air, is the least objectionable of them all, and may be resorted to where other and better agents cannot be obtained. It is liable after a time to become converted into sulphuric acid, and if absorbed into clothing will gradually render it rotten. From its affinity for oxygen it is a deodorizer as well as antiseptic.

9. *Tar Acids, (Carbolic and Cresylic).* It is to the presence of these two substances that tar, smoke, and creosote owe their purifying properties.

Carbolic acid only being the more abundant and more active of the two, will receive attention. The value of this agent as an antiseptic is clearly established in William Crookes' excellent report to Her Majesty's commissioners on the use of disinfectants in arresting the spread of the cattle plague.

He shows that it is destructive to all forms of minute life, even in a state of great dilution, and that it arrests permanently the process of putrefaction. Its cost and peculiar odor, with which we are all familiar in creosote, are the great objections to its use.

The application of wood smoke for disinfecting tenement houses, etc., is very effective, and worthy of especial notice, because it is always at hand and inexpensive.

10. *Permanganate of Potash* is another substance possessing powerful antiseptic as well as deodorizing properties. It is held by Badstübner and others to be more active in neutralizing infectious matter than copperas, but cannot be made to substitute that agent on account of its high price. From being odorless it finds an appropriate application in the sick-room, and is also recommended by the New York Board of Health as the best agent for disinfecting clothing and dressings that are used about the sick, and cannot be immediately boiled. For this purpose a solution of only a few grains to the gallon is necessary. The field of greatest usefulness, however, for this substance is probably to be found in its property of purifying water for drinking purposes.

Impure water is one of the most active agents concerned in the spread of epidemic cholera, (London cholera reports, Weimar sanitary conference,) and to render it pure, therefore, is a matter of vital importance. Dr. Craig, of the Surgeon General's office, has shown that a small quantity of the salt in question, added to a sample of "Potomac water," just sufficient to color the water, has rendered it perfectly pure and entirely tasteless, when it was pervaded by the fishy taste and odor with which all residents of Washington are familiar. This fact is confirmed by many other observers, and indorsed by the New York Board of Health, and is one which has an obvious application at all times when water is impure, as well as during the prevalence of an epidemic.

SUMMARY.

As a summary of the preceeding remarks, the following agents are recommended as most suitable to purposes of general disinfection :

1. Cleanliness and good ventilation to precede, in every instance, the use of all other means.

2. *Sanitary Lime*—quick-lime—to be used freely, in form of powder, in foul streets, alleys, gutters and the like, and as whitewash to walls, fences, outbuildings, etc.

3. *Sanitary Charcoal*, for use similar to the preceding, when the gases of putrefaction are especially abundant. Acts best when mixed with quick-lime to form the "Calx powder."

4. *Chlorinated Lime*, or *Bleaching Powder*, for use where chlorine gas is wanted, and in like manner with quick-lime where a limited quantity only is called for.

5. *Sulphate of Iron—Copperas*—to be used in solution for disinfecting water closets, cesspools, drains and sewers, and particularly the discharges of cholera patients.

And lastly, Mr. President, the committee further recommend that :

1. The corporation have on hand constantly an abundant supply of quick-lime, charcoal, chlorinated lime and sulphate of iron, properly prepared for sanitary purposes, and subject to the order of the president of the Board of Health, the secretary of the Board of Health, or superintendent of Metropolitan Police.

2. That Ward Commissioners be required, between the dates of May 1 and October 1, to cleanse and thoroughly disinfect, by the free use of lime, all foul streets and gutters, and especially foul alleys, within their respective wards, at least as frequently as once a week; and that the regular sanitary officers be required to co-operate with Ward Commissioners in carrying out this provision.

3. That in the event of the occurrence of epidemic or contagious diseases, as *cholera*, the premises should be disinfected under the direction of a member of the Board of Health or sanitary officer; and to this end such diseases should be immediately reported to the secretary of the board or superintendent of Metropolitan Police.

Respectfully submitted to the Board of Health.

